

We claim:

1. A method of manufacturing a sputter target assembly comprising the steps of:
 - a) manufacturing a backing plate, the backing plate having a planar top surface and a cylindrical recess therein, the recess having a depth and a diameter, and the backing plate having a yield strength;
 - b) manufacturing a near final shape target insert, wherein the target insert has a frusta-conical rear surface that corresponds to the cylindrical recess of the backing plate and a front surface, the target insert further having a yield strength greater than that of the backing plate, and a height greater than the depth of the cylindrical recess in the backing plate; and
 - c) hot pressing the target insert into the cylindrical recess of the backing plate to a state of plastic deformation so as to diffusion bond the target insert to the backing plate and form the target assembly, where the target insert protrudes above the planar front surface of the backing plate.
2. The method of claim 1 wherein at least fifty percent of the frusta-conical rear surface bonds to the backing plate.
3. The method of claim 1 including the additional step of maintaining temperature of the target insert and backing plate above 200°C for at least one hour to improve bonding between the frusta-

conical rear surface of the target insert and the backing plate.

4. The method of claim 1 wherein the pressing of the target into near final shape includes consolidating a powder into the target insert.

5. The method of claim 1 wherein the cylindrical recess has a volume and the target insert has a volume; and the cylindrical recess has a volume between about ninety and about one-hundred percent of the volume of the target insert.

6. The method of claim 1 wherein the cylindrical recess has a volume and the target insert has a volume; and the cylindrical recess has a volume approximately equal to the volume of the target insert.

7. The method of claim 1 wherein the front surface of the target insert protruding above the planar top surface of the backing plate has a frusta-conical configuration.

8. The method of claim 1, wherein the cylindrical recess is disposed in a portion of the planar top surface of the backing plate.

9. A sputter target assembly comprising:
a cylindrical backing plate, the cylindrical backing plate having a planar front surface and a recess within the front surface; and

a target insert having a height greater than the depth of the recess of the backing plate, the target insert having a front surface and a rear surface, the rear surface having at least about fifty percent of its surface area conical-shaped and the rear surface being bonded to the backing plate to secure the target insert to the backing plate, wherein the recess is plastically deformed to the shape of the target insert, to form the target assembly and where the target insert protrudes above the planar front surface of the backing plate.

10. The sputter target of claim 9 wherein the recess has a shape conformed to the shape of the target insert.

11. The sputter target of claim 9 wherein a reaction product between the target insert and the backing plate bonds the target insert to the backing plate.

12. The sputter target of claim 9 wherein a conical interface bonds the target insert to the backing plate.

13. The sputter target of claim 9, wherein the front surface of the target insert protrudes above the planar top surface of the backing plate and has a frusta-conical configuration.

14. A sputter target assembly comprising:

a cylindrical backing plate, the cylindrical backing plate having a planar front surface and a recess within the front surface; and

a target insert bonded to the backing plate within the recess of the backing plate, the target insert having a frusta-conical shaped front surface and a frusta-conical shaped rear surface, the rear surface having at least about sixty percent of its surface area conical-shaped and the rear surface being bonded to the backing plate to secure the target insert to the backing plate and form the target assembly, wherein the recess is plastically deformed to the shape of the target insert, to form the target assembly.

15. The sputter target of claim 14 wherein the recess has a shape conformed to the shape of the target insert.

16. The sputter target of claim 14 wherein a reaction product between the target insert and the backing plate bonds the target insert to the backing plate.

17. The sputter target of claim 14 wherein a frustum interface and a conical interface bond to the target insert to the backing plate.

18. The sputter target of claim 14 wherein the front surface of the target insert protrudes above the planar top surface of the backing plate.